

WHAT IS CLAIMED IS:

1. A pattern formation material for electron beam lithography, comprising an alkali-soluble resin and a photoacid generator which generates an acid when 5 irradiated with an electron beam, wherein
said pattern formation material further comprises first and second dissolution inhibiting groups each of which has a capacity of inhibiting dissolution of said alkali-soluble resin in an alkali solution and loses 10 the capacity upon application of an acid, said first dissolution inhibiting group increasing a sensitivity of said pattern formation material when left to stand in a vacuum after irradiated with an electron beam, and said second dissolution inhibiting group decreasing 15 the sensitivity of said pattern formation material when left to stand in a vacuum after irradiated with an electron beam, and
a ratio of said first dissolution inhibiting group to said second dissolution inhibiting group is adjusted 20 such that a size of an alkali-soluble portion, which is a portion made soluble in said alkali solution when said pattern formation material is irradiated with an electron beam, is substantially held constant independently of a standing time in a vacuum.
- 25 2. A material according to claim 1, wherein at least one of said first and second dissolution inhibiting groups is a functional group which modifies

said alkali-soluble resin.

3. A material according to claim 1, wherein said pattern formation material further comprises a dissolution inhibitor, and at least one of said first 5 and second dissolution inhibiting groups is a functional group which forms said dissolution inhibitor.

4. A material according to claim 1, wherein said first dissolution inhibiting group is a 10 t-butoxycarbonyloxy group.

5. A material according to claim 1, wherein said second dissolution inhibiting group is an acetal-type functional group.

6. A material according to claim 1, wherein the 15 ratio of said first dissolution inhibiting group to said second dissolution inhibiting group is adjusted such that a difference between the size of said alkali-soluble portion immediately after irradiated with an electron beam in a vacuum and the size of said 20 alkali-soluble portion left to stand for 10 hr in a vacuum after irradiated with an electron beam is not more than ± 5 nm.

7. A pattern formation method using a pattern 25 formation material for electron beam lithography, said pattern formation material comprising an alkali-soluble resin and a photoacid generator which generates an acid when irradiated with an electron beam, said pattern

formation material further comprising first and second dissolution inhibiting groups each of which has a capacity of inhibiting dissolution of said alkali-soluble resin in an alkali solution and loses the 5 capacity upon application of an acid, said first dissolution inhibiting group increasing a sensitivity of said pattern formation material when left to stand in a vacuum after irradiated with an electron beam, and said second dissolution inhibiting group decreasing the sensitivity of said pattern formation material 10 when left to stand in a vacuum after irradiated with an electron beam, comprising the steps of:

15 determining a ratio of said first dissolution inhibiting group to said second dissolution inhibiting group such that a size of an alkali-soluble portion, which is a portion made soluble in said alkali solution when said pattern formation material is irradiated with an electron beam, is substantially held constant independently of a standing time in a vacuum;

20 forming a photosensitive film by coating a surface of an object to be processed with said pattern formation material containing said first and second dissolution inhibiting groups at the determined ratio;

25 performing electron beam writing on said photosensitive film; and

forming a patterned film by developing said photosensitive film subjected to the electron beam

writing.

8. A method according to claim 7, further comprising the step of etching the surface of said object to be processed by using said patterned film as
5 an etching mask.

9. A method according to claim 7, wherein at least one of said first and second dissolution inhibiting groups is a functional group which modifies said alkali-soluble resin.

10 10. A method according to claim 7, wherein said pattern formation material further comprises a dissolution inhibitor, and at least one of said first and second dissolution inhibiting groups is a functional group which forms said dissolution
15 inhibitor.

11. A method according to claim 7, wherein said first dissolution inhibiting group is a t-butoxycarbonyloxy group.

20 12. A method according to claim 7, wherein said second dissolution inhibiting group is an acetal-type functional group.

25 13. A method according to claim 7, wherein the ratio of said first dissolution inhibiting group to said second dissolution inhibiting group is adjusted such that a difference between the size of said alkali-soluble portion immediately after irradiated with an electron beam in a vacuum and the size of said

alkali-soluble portion left to stand for 10 hr in a vacuum after irradiated with an electron beam is not more than ± 5 nm.

14. An exposure mask fabrication method using
5 a pattern formation material for electron beam lithography, said pattern formation material comprising an alkali-soluble resin and a photoacid generator which generates an acid when irradiated with an electron beam, said pattern formation material further comprising first and second dissolution inhibiting groups each of which has a capacity of inhibiting dissolution of said alkali-soluble resin in an alkali solution and loses the capacity upon application of an acid, said first dissolution inhibiting group increasing a sensitivity of said pattern formation material when left to stand in a vacuum after irradiated with an electron beam, and said second dissolution inhibiting group decreasing the sensitivity of said pattern formation material when left to stand in a vacuum after irradiated with an electron beam,
10 comprising the steps of:

20 determining a ratio of said first dissolution inhibiting group to said second dissolution inhibiting group such that a size of an alkali-soluble portion, which is a portion made soluble in said alkali solution when said pattern formation material is irradiated with an electron beam, is substantially held constant
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independently of a standing time in a vacuum;

forming a light-shielding film on one principal surface of a transparent substrate;

5 forming a photosensitive film by coating the surface of said light-shielding film with said pattern formation material containing said first and second dissolution inhibiting groups at the determined ratio;

10 performing electron beam writing on said photosensitive film;

15 forming a patterned film by developing said photosensitive film subjected to the electron beam writing; and

20 etching said light-shielding film by using said patterned film as an etching mask.

15. A method according to claim 14, wherein at least one of said first and second dissolution inhibiting groups is a functional group which modifies said alkali-soluble resin.

25 16. A method according to claim 14, wherein said pattern formation material further comprises a dissolution inhibitor, and at least one of said first and second dissolution inhibiting groups is a functional group which forms said dissolution inhibitor.

25 17. A method according to claim 14, wherein said first dissolution inhibiting group is a t-butoxycarbonyloxy group.

18. A method according to claim 14, wherein said second dissolution inhibiting group is an acetal-type functional group.

5 19. A method according to claim 14, wherein the ratio of said first dissolution inhibiting group to said second dissolution inhibiting group is adjusted such that a difference between the size of said alkali-soluble portion immediately after irradiated with an electron beam in a vacuum and the size of said 10 alkali-soluble portion left to stand for 10 hr in a vacuum after irradiated with an electron beam is not more than ± 5 nm.